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Top 10 Commandments of Ohio Construction Law

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Asphalt Wins Optional Bid Project, No Concrete Bid Submitted

The first in a series of Ohio Department of Transportation (ODOT) projects that solicit bids for both asphalt and concrete pavements produced an interesting outcome.

Last year, a neutral third party of independent consultants created by the Ohio Legislature to review ODOT’s pavement-selection process recommended that ODOT do five to 10 optional bid projects – projects in which contractors can bid either asphalt or concrete pavement.

Optional bids were taken on June 4, 2004, for the major rehab and lane addition of Interstate 70 in Madison and Clark counties west of Columbus. The project provided for a $1.1-million “bid adjustment factor” to be added to the asphalt bids to reflect the assumed difference in future maintenance costs over the next 35 years.

Three bids were submitted by asphalt contractors. No bids using a concrete pavement were submitted. The low bid was $55,078,471, which was 2 percent under the state’s estimate.

This is not the first time ODOT has used optional bids; in 1998, this procedure was used on two major projects. The first was GRE-35-21.14, which was a new four-lane facility on new alignment. This project drew six bidders, all of whom bid the asphalt option. The second project was WOO-75-41.963, which was an interstate rehab and lane addition. Again, all bids were asphalt with no concrete bids submitted. Both of these projects were straight bids, and did not include the “bid adjustment factor” required for the I-70 project.

What does all of this mean, and why is it important? Since the project was designed “blind,” that is the project set no parameters to advantage a particular pavement material, it proved the economy of asphalt pavement and explains why ODOT’s Life Cycle Cost Analysis and Pavement Selection Process would predominantly pick asphalt rather than concrete for new pavements and major reconstructions. It is important because it refutes the claim of the Ohio Concrete Paving Association that ODOT’s pavement-selection process is intentionally biased to pick asphalt.

We still have five more optional bid projects to come. I am confident the result will be the same, even if the concrete industry decides to submit a bid. The results of this experiment are further proof that asphalt pavements really are more economical – both initially and in the long run. Asphalt is easier to maintain and provides a quiet and smooth ride. It’s simply a better value in every respect.

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There is growing interest among pavement engineers in the potential of extra long-lasting bituminous pavement, known as “perpetual pavement.” The latest research has culminated in the development of this pavement design, which researchers believe can perform for more than 50 years without major structural rehabilitation or reconstruction.

Perpetual pavement is constructed of three very durable layers. Materials are mixed to achieve maximum performance qualities specialized to the demands of each layer. Factors such as traffic and environmental conditions are also taken into consideration. The top layer is made of impermeable material that is resistant to ruts, weathering and general distress, and the middle layer also holds up against ruts and wear. The base layer is highly durable and has superior resistance to fatigue cracking. Due to the strength of this multi-layer design, wear is limited to the top layer, so periodic resurfacing is the only maintenance required. When distress is observed on the pavement surface, the top pavement layer can be removed and replaced to the same depth, resulting in significant savings of both money and time.
The use of long-life pavements has been proposed in Europe, and the idea is rapidly gaining ground in the United States. While the ability currently exists to produce perpetual pavements, the engineering community is working to establish guidelines and procedures for building these structures. Studies are also being conducted in an effort to validate the promising expectations of this pavement technique before it is implemented on a broad scale. As part of this verification effort, Interstate 77 in Ohio has been instrumented with a number of strain gauges and pressure cells, and a controlled truck test is also being conducted.

**I-77 Instrumentation (North Canton)**

On Aug. 25, 2003, a preliminary test section was instrumented on I-77 in North Canton. The test pavement consisted of six inches of Dense Aggregate Base (DGAB, Ohio Department of Transportation (ODOT) 304), followed by 13 inches of Bituminous Aggregate Base (ATB, ODOT 302). This base layer was placed in three lifts. A 1.75-inch intermediate surface layer was also placed. The final 1.5-inch surface layer has not yet been placed.

This 20-foot section in the driving lane of northbound I-77, between 38th Street and Everhard Road, was instrumented with Geokon strain gauge pressure cells, Dynatest quarter bridge AC embedment gauges and thermocouples. Figure 1 illustrates the instrumentation detail, and shows the location of the sensors in the pavement profile.

On Dec. 15, 2003, data was collected from these sensors in response to a load applied using an ODOT single-axle truck. The axle weight of the truck was approximately 26,000 pounds and the truck’s speeds varied between 5 miles per hour (mph) and 50 mph. During the tests, which were conducted at night due to traffic restriction, the average surface temperature of the asphalt was approximately 31°F, and average pavement temperature, as measured by the thermocouples, was 36°F.
Figures 2 and 3 show the response from the longitudinal strain gauges for speeds of 5 and 40 mph. Figures 4 and 5 show the response of the pressure cells for the same speeds.

Generally, pavement is designed to withstand a maximum strain of 60 microstrain. Figures 2 and 3 show the strain on these test sections is less than half the maximum allowable. As expected, the maximum strain for a speed of 5 mph is greater than the strain for 40 mph due to the visco-elastic properties of asphalt.

These experiments were conducted at 31°F. At higher temperatures, the asphalt stiffness will decrease and strain will increase. However, due to the thickness of the asphalt, the temperature at the bottom of the asphalt pavement will not fluctuate significantly. Therefore, the strain will still potentially be less than the maximum design strain.

This article was submitted by Dr. Shad Sargand, Russ Professor, Department of Civil Engineering, Ohio University.
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TOP 10
COMMANDMENTS OF OHIO CONSTRUCTION LAW

There are 10 key “commandments” in Ohio that govern construction law. Remember these and you will hopefully avoid any biblical disasters:

1. **Thou shall pay promptly.**
   ORC §4113.61: Ohio requires contractors to pay their subs within 10 calendar days after receipt of the payment from the owner for that work or face 18-percent interest per annum and attorney’s fees.

2. **Thou shall not hide behind “no damage for delay”**.
   ORC §4113.62(C)(1) and (2): Ohio finds “no damage for delay” clauses unenforceable when the cause of the delay is the owner’s “actions or inactions.”

3. **Thou shall not hide behind final payment.**
   ORC §4113.62(B): Ohio does not recognize final payment as a defense when there is prior written notice of a claim before final payment is received.

4. **Thou shall be responsible for one’s own negligence, in whole or in part.**
   ORC §2305.31: Ohio’s anti-indemnity statute makes unenforceable any indemnity provision in a construction contract that attempts to make one responsible for another’s negligence for personal injury or property damage.

5. **Thou shall be permitted to “pay if paid” (but liens still may be filed).**
   ORC §4113.62(E): Unambiguous “pay if paid” clauses are enforceable, but do not bar the timely filing of mechanic’s liens.

6. **Thou shall go forth to arbitration.**
   ORC §2711.01: Ohio’s public policy favors arbitration and compels arbitration when there is a written agreement to arbitrate.

7. **. . . and an order that denies a stay is a final appealable order.**
   ORC §2711.02: As Ohio wants to encourage arbitration, only an order that denies a stay (pending arbitration) is appealable; an order compelling arbitration is not appealable.

8. **Thou shall sue in Ohio (on Ohio projects).**
   ORC §4113.62(D)(2): Disputes concerning Ohio construction projects are only supposed to be litigated in Ohio courts.

9. **Thou shall apply Ohio law.**
   ORC §4113.62(D)(1): Ohio law is to apply to Ohio construction projects regardless of the choice of law provision in the contract.

10. **Thou shall not waive bond rights.**
    ORC §4113.62(A): In Ohio, one cannot waive bond rights “up front” in a contract.

In short, Ohio has much law restricting “freedom of contract” in the construction industry in an effort to avoid inequitable contracting practices.
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In recent years, changes in the mix types and layer thicknesses used by the Ohio Department of Transportation (ODOT) have nearly eliminated rutting on its freeway system. Yet rutting is still sometimes observed on other roads and streets, especially at what we call high-stress locations (i.e., intersections, grades, any places where heavy vehicles stop, start, turn or climb steep grades). These types of pavement defects need not be tolerated, as the asphalt pavement technology exists to prevent or correct such problems.

**Why Pavements Deform**
Prevention or correction begins with an understanding of the types and causes of pavement deformation. There are four types of rutting, or as it is sometimes known as channelization:

- Mechanical deformation or subgrade displacement of the asphalt pavement
- Plastic deformation of the asphalt mixtures near the pavement surface
- Consolidation or the continued compaction under the action of traffic
- Surface wear, the actual wearing away of surface particles by traffic

While the specific mode of failure must be determined before selecting a solution, this article focuses on the issue of plastic deformation and the prevention or correction of plastic deformation failures.

**Plastic Deformation** is a material failure of the asphalt concrete. The mix is displaced from under the tires and typically humps up outside the wheel tracks. Plastic deformation sometimes appears as shoving or corrugations in the pavement as well as rutting. A cross-section of a pavement exhibiting plastic flow deformation will typically look like Figure 1.
In the case of plastic deformation, the mix lacks the internal strength to resist permanently deforming under the stress imposed by the loaded vehicle tires. The internal strength of the mix is affected by the friction characteristics of the aggregates, especially the fine aggregate, and the visco-elastic properties of the asphalt binder. Angular aggregates have higher internal friction to help resist deformation under load. Stiffer or more elastic binders resist becoming sufficiently viscous at high pavement temperature to allow the pavement to deform under constant or slowly moving loads. In addition, the two materials must be combined in the optimum proportions through a rigorous mixture-design procedure that ensures the proper air voids are incorporated in the compacted mixture. Excess asphalt content will enable plastic deformation within the mix.

Prevention of plastic deformation depends on specifying mixtures that are properly designed. Mixtures must have an adequately angular aggregate structure, and have a grade of asphalt binder that is sufficient to resist flow at the expected high pavement temperatures and loading conditions. Consideration must be given to both magnitude of load and speed of loading.

Correction of a plastic deformation condition will usually consist of removing all the deformed asphalt concrete and replacing it with material that is adequately stable to resist the stress and temperature conditions.

**Determining the Mode of Failure**

Before attempting to correct these defects it is necessary to conduct an investigation to verify the type of deformation present. This investigation may be as simple as a visual inspection on small and relatively low-cost projects, all the way up to an extensive program of sampling and testing. There are several methods that may be used.

Trenching is the most effective method to determine the cause of rutting. In this method, parallel, transverse, full-depth saw cuts are made across the pavement, and the intervening material is removed to expose the full cross-section of the pavement. It is then straightforward to identify the deforming pavement layers.
and determine the mode of failure. In the case of plastic deformation, it is usually possible to identify which individual pavement layers are deforming. The correction of plastic deformation involves removing all of the asphalt material to a depth that includes the deformed layers, and replacing it with stable mix.

Where trenching is not feasible, it is usually possible to make the same determination from cores. In this method, cores are taken across the rutted lane at the points of maximum rut and at maximum heave and at relatively un-deformed areas for comparison of the layers. The surface of the cores should be referenced in elevation so that the deformation can be accurately plotted. By using the surface elevations of the cores, and measuring the visible layers in the cores, it is possible to graphically represent the cross-section of the pavement, determine the mode of failure and identify the deforming layers. Figure 2 is an example of cores taken across a rutted lane.

An analytical method for determining the mode of failure was developed under the National Cooperative Highway Research program (NCHRP) project 1-34A (1) by researchers Thomas White and John Haddock at Purdue University. This method uses the numbers from a measured transverse-surface profile to calculate coefficients that indicate the mode of failure. This method may be most useful where destructive methods of testing are not feasible. Details of the analysis method can be found in the Appendix of the reference. (1)

Correcting rutting in asphalt overlays over concrete pavement presents special challenges

Treatments to Prevent or Correct Plastic Flow Deformation

As previously stated, correction of a plastic flow failure involves removing all the deforming pavement layers and replacing them with mix that is designed to withstand the high stresses without deformation. If a forensic investigation has been performed, the affected layers will have been identified through that process. Where such an investigation is not warranted or feasible, the “rule of thumb” is to place four inches of stable material. It is generally accepted that most plastic deformation occurs in the top four inches of the pavement. However, forensic investigations have occasionally documented deformation occurring deeper. Thus, there is some risk involved in using the “rule of thumb” as it is usually not possible to stop rutting by placing...
stable material over deforming material. ODOT’s manual (2) recommends planing the rutted pavement to a depth of three inches below the deepest point of the rut.

Correcting rutting in asphalt overlays over concrete pavement presents special challenges. The interface between a thin asphalt overlay and a concrete surface can be a shear plane where stresses concentrate. It is not uncommon for asphalt concrete overlays to shove on the surface of the concrete, exacerbating the problem of rutting. If the forensic investigation does not reveal that at least 2 inches of stable material can remain on the concrete after milling all of the deformed material, then, the recommended treatment in these cases is to mill off the asphalt overlay. To provide some mechanical interlock for the surfacing materials, milling should scarify, or roughen, the concrete surface. Prior to placing the new asphalt overlay, a rubberized tack coat, Item 702.13, is usually used on concrete to improve adhesion.

Choosing Rut-Resistant Materials
There are several options in ODOT’s Specifications (3) for materials that will stand up in high-stress applications. Item 441, Asphalt Concrete, Type 1H or Item 442, Superpave Asphalt Concrete, Type B, 12.5 mm are generally adequately stable for high-stress locations on roads and streets having moderate volumes of heavy trucks. By ODOT specification, these mixes incorporate a polymer modified binder, performance grade PG 70-22M for the surface course only. For use in high-stress locations we recommend that the amount of polymer modification be increased by specifying PG 76-22M (per SS 908) for both the surface and intermediate courses. For economy on smaller projects, we suggest placing the same material as both the intermediate and surface course. These mixes can be placed as thin as 1.5 inches; however, on a high-stress application we suggest placing two, 2-inch-thick courses to achieve a 4-inch build-up of rut-resistant mix. On large projects the intermediate course could be a 441, Type 2, Heavy or a 442, Type B, 19 mm, both with PG 76-22M binder placed at least 1.75-inches thick for economy.

On new construction, the designer must determine the extent of the pavement to receive a special high-stress treatment. ODOT (2) recommends at least 250 feet back from the stop termini at an intersection. If a number of high-stress locations exist in close proximity, it is probably most economical to treat the entire project area with the more rut-resistant mix.

For roads and streets having high volumes of heavy trucks, tougher material is needed. Item 442, Superpave Asphalt Concrete, Type A uses all crushed aggregates for both the coarse and fine-aggregate portions of the mix. These mixes can be expected to have greater stability than the Type B mixes. The binder recommendation is the same, PG 76-22M. When specifying Item 442 mixes for high-stress locations, specify a design compaction level (Ndes) of 100 gyrations. The ultimate mix for resisting deformation and ensuring longevity is, however, specified under Supplement Specification (SS) 856, Stone Mastic Asphalt Concrete. Use PG76-22M binder for both the surface and intermediate courses.
These are not the only possibilities for treating high-stress locations. For lighter-traffic applications, it may be sufficient to modify the standard mix by the upgrade to a polymer modified binder. ODOT’s Supplemental Specification SS 908 makes this simple by defining two polymer-modified binder grades, PG 70-22M and PG 76-22M. For very small projects other options include modified standard mixes that incorporate polyester fibers, SS 826 or Gilsonite, SS 857. Our “rule of thumb” recommendation is summarized in Table 1:

Table 1: Conventional asphalt pavement course and material treatments for high-stress locations:

<table>
<thead>
<tr>
<th>Thickness</th>
<th>Material Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 3/4 in. Minimum</td>
<td>Item 442, asphalt concrete intermediate course, 19 mm, Type</td>
</tr>
<tr>
<td>2 1/4 in.</td>
<td>A or B, (446)</td>
</tr>
<tr>
<td>Recommended</td>
<td>Ndes = 100, PG 76-22M</td>
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<tr>
<td>1 1/2 in. Minimum</td>
<td>Item 442, asphalt concrete surface course, 12.5 mm, Type A,</td>
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<tr>
<td></td>
<td>(446), Ndes = 100, PG 76-22M</td>
</tr>
<tr>
<td>1 3/4 in.</td>
<td>Recommended</td>
</tr>
</tbody>
</table>

Note: PG and polymer-modified binders per SS 908
All specification references are to the 2002, ODOT, CMS (3)

Summary
The solutions for preventing rutting deformation in new pavement construction and for correcting existing deformed pavements are readily available. The solution includes ensuring adequate structural capacity of the pavement, determining the mode and extent of the failure or area requiring special treatment, and in specifying appropriately rut-resistant materials for the anticipated traffic type.

References:
1) NCHRP Report 468,
3) State of Ohio, Department of Transportation, Construction and Material Specifications, Ohio Department of Transportation, 2002
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<table>
<thead>
<tr>
<th>Company</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt Materials</td>
<td>17</td>
</tr>
<tr>
<td>Asphalt Pavement Alliance</td>
<td>9, BC</td>
</tr>
<tr>
<td>Cantwell Machinery</td>
<td>IFC</td>
</tr>
<tr>
<td>Cleveland Barricading Systems</td>
<td>17</td>
</tr>
<tr>
<td>Highway Rubber Products</td>
<td>17</td>
</tr>
<tr>
<td>North Star Asphalt</td>
<td>13</td>
</tr>
<tr>
<td>Ohio CAT</td>
<td>11</td>
</tr>
<tr>
<td>Protection Services</td>
<td>15</td>
</tr>
<tr>
<td>Southeastern Equipment</td>
<td>IFC</td>
</tr>
<tr>
<td>The Shelly Company</td>
<td>5</td>
</tr>
<tr>
<td>United Rentals Highway Technologies</td>
<td>5</td>
</tr>
<tr>
<td>Unique Paving Materials</td>
<td>5</td>
</tr>
<tr>
<td>Valley Asphalt</td>
<td>18</td>
</tr>
</tbody>
</table>

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